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IRRIGATION IN THE TERRITORIES.

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EXTRACTS FROM THE CALGARY TRIBUNE

Given a section of country in Southern Alberta and Western Assiniboia which can not be successfully farmed continuously without irrigation; and assuming for the sake of argument that, in a new and sparsely settled country, such as it is, the necessary works can not be established on a sufficiently large scale without aid from the Dominion parliament, the first question to consider is how far parliament is in duty bound to render the needed assistance, and to what extent it would be justified in expending public money for this purpose.

To reach proper conclusions on a matter of so much moment both to the localities indicated and to the country as a whole, we must enquire what the policy and practice of the parliament of Canada has been in the past in regard to promoting public improvements and in aiding public enterprises which, without the assistance of the public monies, could either not be established at any time or would still be in the womb of the future.

It is safe to say that during the lifetime of Canada this proposition has held good, namely, that if it was actually necessary in order to promote the prosperity of the country and add to the general commerce and wealth that the aid of the government should be called in, then such aid should be forthcoming to a reasonable extent and within the means of the country. It is further held in Canadian practice and experience that if this aid be granted in money, the government should not expect dividends on its investment, being content with seeing the public objects of such assistance successfully accomplished.

We propose to show, as briefly as possible, that if the parliament of Canada is justified in voting public money and devising special legislation for the benefit of the farmer, the manufacturer, the merchant, the miner, the shipping interests and fishing interests of Eastern Canada, it will be doubly justified in expending public money in establishing and operating Irrigation Works in Southern Alberta and Western Assiniboia. And in this connexion a glance at some of the enterprises and legislation sanctioned by parliament relating specially to the Eastern Provinces, is in order.

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1. The Intercolonial Railway of Canada, designed to promote trade between the Maritime Provinces and the Provinces of Ontario and Quebec, was built by the government alone, immediately after confederation, and has ever since been operated by them at a dead loss to the general revenues of Canada. The government have altogether an original construction investment of some $44,000,000 in the Intercolonial Railway and connected branches. They have paid interest on that investment at the rate of about 4 per cent., for various periods during the last 22 years, which would amount to about another $13,000,000. And it has, besides, lost in running the road probably a further $8,000,000. At the very least the government have invested up to this time in the Intercolonial Railway and its branches $65,000,000. Still, the road was considered a necessity to the development of Inter-Colonial trade in the Eastern Provinces; it has helped to create a great inter-colonial traffic; it has carried the products of those

provinces back and forth at a very cheap rate; and has thus proved a great benefactor to the country traversed. Many of its branches are purely local lines, constructed for the convenience and advantage of certain localities alone, although built solely out of public funds. Every resident of the Northwest Territories is taxed to support the Inter-Colonial Railway, and these local branches (including the Prince Edward Island lines), and to make good the money sunk in them and the deficits caused by cheap freight rates, of which the farmers, millers, manufacturers, lumbermen, fishermen miners and merchants of the Eastern Provinces receive the principal if not the sole benefit.

2. Take the Canadian canals as an example of a necessary but non-dividend paying expenditure. These have been constructed by the Government of Canada at a cost of not less than $60,000,000, exclusive of repairs. They were constructed in order to overcome the obstructions which Nature had placed in the path of successful navigation of the St. Lawrence, Ottawa and other rivers and waters in the provinces of Ontario and Quebec. (The cost of the Sault Ste. Marie canal, unfinished, is not taken into account). They have not paid even working expenses, to say nothing of the cost of construction, or the interest on the capital put into them. Still, they are regarded as one of the most valuable of the Dominion's assets; they have certainly tended to cheapen the rates of transportation for the products mainly of Ontario and Quebec; and they thus render a great public service. To the loss of capital and interest and in working expenses, on these canals, the people of the Northwest contribute every day of their lives, and will for all time.

3. Next in order we refer to Parliament's Protective Policy. This policy was adopted 15 years ago by Parliament without reference to Northwest interests; and in fact the Northwest Territories had nothing whatever to say in regard to its acceptance, not having representation in Parliament. Without entering into a controversy as to the merits or demerits of a Protective Policy for Canada, it may be held that, whatever its advantages may be, it is not seriously denied that Protective Duties mean a considerable tax on all consumers—that is, on all of the five millions and odd of people constituting our Dominion population. The party favoring this policy—about one half of the whole of the population—maintain that these duties are imposed for the benefit of the country at large. While they may bear hard in some quarters—especially in the Northwest—it is claimed that they have been instrumental in adding an important element of national strength, by rendering us to a considerable extent independent of the manufactured products of other countries. It is further claimed that these duties build up the towns and cities of the Eastern Provinces, and the claim can not be denied. At the best, the advantage is mainly sectional; what there is goes chiefly to the Eastern Provinces which do the manufacturing for the whole Dominion; and for the gain chiefly of the Eastern Provinces we in this western country are specially taxed under a Protective Tariff designed for the general advantage.

4. There is the bonusing of Railway Companies and Steamship Lines. The Canadian Parliament has done this on a magnificent scale. Steamship lines are subsidized to carry passengers and mails and natural and manufactured products to China and Japan,—to England—to Australia—to the West Indies. Not only so but the Provincial Governments are supplied from the Dominion chest with the funds to subsidize subsidiary lines of steamers on all their coasts. This is done to stimulate trade, cheapen the cost of freight and travel, and conduce to the general prosperity of the country.

It is the same with Railways. To say nothing of the subsidies to the great lines of communication, such as the Grand Trunk, the Canadian Pacific and other lines that received enormous subsidies and bonuses, there have been heavy subsidies to every line of railway built in any of the provinces, many of which (besides the Inter-Colonial branches) are purely local lines, even the names of which are not known outside of the province in which they are constructed. These roads were so assisted by the Canadian Parliament

because they were declared to be necessary to the development of the tributary country and its commerce. They were intended "to give the farmers access to the best markets," to cheapen the cost of transportation of farm products, lumber, coal, minerals, store goods, etc., and thus "promote the progress and development of the country." It is claimed that in this way successive Dominion governments have rendered an immense service to the agricultural and commercial interests of Canada; and it is not proposed to dispute the claim. We do know that in the Northwest we are helping to pay what it has cost the Federal Government to thus promote the public good. This cost to the country has been something enormous, there having been paid in bonuses to railways by the Canadian Parliament from first to last, no less a sum than $145,000,000 to $150,000,000 in cash, besides land grants amounting to 50,000,000 acres, equal in value to at least another $150,000,000. This is in addition to unpaid loans to railways of over $21,000,000.

5. In various other ways the system of bonusing, aiding, promoting, stimulating, has been carried on at the public expense. Public monies and public lands have been freely given as long as Parliament could say: "This is done to promote the development and help on the prosperity of the country." Take a few additional instances of special legislation and special expenditures "for the general advantage."

The Government, for instance, maintain at great expense Experimental Farms bringing in little or no revenue; they have Dairy Commissioners travelling and educating the people in cheese and butter making, and they actually engage in the manufacture of butter to show "how to do it." The expense and labor are incurred for the general advantage but especially for the benefit of the farming population. Bounties are paid to fishermen out of the public funds. A Fishery Intelligence Bureau is maintained during a considerable portion of the year to notify fishermen on the Atlantic coast of the appearance of schools of fish at certain points. Fish Hatcheries are maintained at great expense in all the Provinces. All these expenditures are claimed to be for the general good, although the advantage may seem to be largely local in the practical working out. The Post Office Department is kept up to a state of efficiency at a heavy annual loss, the deficits for the last 26 years aggregating $13,000,000; but the advantage to the public warrants the extra expenditure. Manufacturers are paid out of the treasury drawbacks on their products exported from the country; and although this may look as if more for the individual than the general good, no complaint is made. Lighthouses and Buoys and Beacons are erected at all important points on the coast and in interior waters for the special protection of shipping. There is no direct cash return to the treasury but the interests of navigation and commerce are held to warrant the expenditure.

The system of granting Government aid where it is actually needed, and even where such aid makes mainly for local advantage, having been stretched to cover so wide a field, why should the line be drawn at Irrigation? Why should the government lands and the government monies not be utilized to promote the development of the country and the interests of agriculture and trade in this certain and invaluable way? Bringing water to arid lands means bringing wealth to the country; adding to the prosperity of the country; ensuring the yield of crops; rendering the farmer independent of the drawbacks of climate. Are these gains not as important to the interests of the country as a whole as the cheapening of transportation in certain districts of Canada? If it is wise to run the Intercolonial railway at a public loss in order that the Ontario farmer may market the product of his farm cheaply in the Maritime Provinces, and that the latter may have cheap food, on what principle can the Dominion Parliament refuse to come to the farmers' and the country's aid in Southern Alberta and Western Assiniboia by establishing Irrigation Works which will ensure crops in every season? If the Government and Parliament consider it wise and profitable, in order to build up inter colonial trade, to transport coal from Nova Scotia to Ontario and Quebec at a dead loss for every ton carried over their railway, and if they think it just to tax the country as a whole for the benefit of this special traffic, what excuse can they offer for not lending a helping hand to bring into abundant fertility a large area of country which only needs this assistance to become the garden of Canada? Is it more advisable that the Government funds should be expended on

local railways in the East, which in some cases have no excuse for being, than it is to make an earnest effort to give priceless value to millions of acres of valuable lands to which nature has denied a generous rainfall? And how long do our Eastern fellow citizens suppose we will remain content to help make up the deficiency on such transactions as we have indicated, if we are refused this act of justice on precisely the same lines of public policy? Either abolish ALL bonusing, make every investment by the Government pay a dividend, or extend to this country in connexion with the crying want of a considerable area of territory, the same generous principle which has been applied so liberally in the east.

Now the tens of millions of dollars already sunk in bonuses, the hundreds of millions or more paid by the people to engraft the protective system on the Dominion, the uncounted millions spent in the construction of great public works which do not bring in a dividend, are gone for ever. Whatever the gain to the country at large in commercial advantages or the saving individually to the citizen in the cost of living. one thing is certain, the Government Treasury will not see one dollar of this money returned to it, No such loss to the Treasury will result from Government financial aid to irrigation in Southern Alberta or Western Assiniboia. There will be no loss but an absolute gain from the start. The Government with its millions of acres, as the largest land owner in the country, will be providing a cash market for every acre of its land that it irrigates—lands which will then command the highest prices of any that will be open to purchase.

Outside of its own lands, the Government will not irrigate an acre of railway or private land without making the owner pay for the water; and if it be objected that the Government should not be dealing in water or engaging in unusual transactions of that character, the answer is very simple.—Refer to the Blue Books and note the Government's transactions with the mill owners and factories that line its canals; look at its business transactions with all the merchants and shippers per railway from Quebec to Halifax and throughout the Maritime Provinces; and take notice of its dealings as nearly the greatest land proprietor of the Continent, with the thousands who buy or homestead public lands and lease its timber and mineral lands. This objection, therefore, is one calling for very slight consideration and is not to be entertained for a moment in view of the great benefits to accrue from the government having it in their power to do in a large way and for tens of thousands of people a work which private capital can not yet possibly overtake.

The incidental gain to the government from being in a position to supply water to their arid and at present worthless lands will be enormous. Tens of thousands of farmers in the United States give the preference to irrigated lands over all others, and any number of these stand ready to enter this country (where local taxation is so light compared with the heavy burthens they are compelled to bear in their present homes) and to buy these lands at reasonable prices; and it is a safe prediction that Canadians too will give a preference to such lands. Our irrigated lands would be a new and fresh attraction to all newcomers The Dominion would be strengthened by the flow of population into Southern Alberta and Western Assiniboia, which would set in at once. And thousands of new settlers would come from outside to contribute to the consumption of duty-paying goods, thus swelling the Dominion revenues at once.

What would be the gain to Central and Southern Alberta and Western Assiniboia? Simply incalculable. Towns such as Calgary, Macleod, Lethbridge and Medicine Hat would be surrounded by a numerous and prosperous agricultural population, whose crops would be ensured from year to year beyond all peradventure. At the railway or trail crossings of all our large rivers would spring up small towns, to be the local centres of prosperous settlements. Cheese making, buttermaking, straight farming, mixed farming, stock raising, flour milling, and kindred industries would flourish beyond all precedent in Canada. A prosperous farming population would establish the future of the towns and create a trade that could not be taken away. Whatever may be done in farming or dairying in other parts of the Dominion would be excelled here, where the rich soil only awaits the fertilizing influence of our mountain waters to produce everything that can be produced from the earth, not excepting the finest fruits. What are now the most arid parts would then be the the most fertile; and lands now unoccupied, which can not even be given away, would then be the most valuable. The cost of production of beef,

mutton, cheese, butter, hay, grain, etc., would be reduced to a minimum, the experience of all irrigated countries being repeated here.

When one considers for what futile purposes and reckless experiments the public money of Canada has been expended in the past, there is no reason for any false modesty on the part of Albertans or Assiniboians in putting forward, respectfully but firmly, a claim on the parliament of the Dominion for the expenditure of a reasonable sum in the construction of Irrigation works. We have the best country under the sun, and we ask the government to help us (as they have helped other provinces and districts) in its development. We ask this not merely for our own advantage. but for the general good of the country, which is deeply interested in the prosperous building up of this portion of the Dominion. We ask for equitable treatment and the frank consideration of our wishes. We know our wants and necessities better than others can tell us; and we claim that, beyond all things necessary to the prosperity of Southern Alberta and Western Assiniboia, stands this question of the construction of Irrigation Works, and that by the government of the Dominion.

[No. 2]

Having made a claim upon the Dominion Parliament, for the general good of the country, to aid Southern Alberta and Western Assiniboia by the construction of Irrigation Works, it is in order to show what Irrigation has done for other countries. Although the application of the principle may be new in Canada, Irrigation is a very old method of promoting agriculture in many parts of the world. The utilization of the overflow of the Egyptian Nile by means of canals and ditches and embankments, dates very many centuries back, and travellers to this day tell us of the wonderful crops they have seen secured over great areas in that country by means of irrigation, the methods being none of the best and the intelligence of the farmers being below par. Irrigation in India has been followed ever since Europeans knew anything of the land, and there are found the remains of great canals and waterways which must have been constructed at enormous cost far back in the ages, and were allowed to become useless. Many of these canals have been restored and are now doing over again, under British rulers, the great work which centuries ago they performed under native princes. That Irrigation plays a great part in the development of the agricultural interests of India may be inferred from the fact that under the government of that country there has been expended in the last twenty-five years over $150,000,000 in reclaiming land or making it secure to the cultivators by new water supply works, and that in this way Irrigation has added to the cultivable area not less than 30,000,000 acres in the period mentioned. More than half of this has been accomplished in the last fifteen years. As regards the wisdom of the investment we have it on good authority that "the profit thereon is large, though obtained from indirect methods, such as land revenue and the increase for industry found in the security and peace of the Empire. A considerable proportion of the works, however, have yielded a fair per cent. of profit for several years on the large capital invested. In the Northwest provinces, for example, where the Administration has been able to concern itself with some simple questions, though of great magnitude, such as the reclamation of new land, the restoration on purely engineering grounds of old works, the renewal and settlement of land-workers or ryots, and the framing and execution of simple laws and regulations based on old customs and rules, the direct profit resulting on capital invested has been sufficient to satisfy the most exacting of investors. As nearly all know, the cultivated land in China, especially in the vicinity of the great rivers, yields larger returns than anywhere else in the world. This is due mainly to Irrigation in which the Chinese are singularly proficient. In Italy Irrigation is a very old story. Though the greater part of Italy is

blessed with a generous rainfall, Irrigation is carried on even in those most highly favored districts more successfully than elsewhere in Europe. The Italian government has spent enormous sums in providing the great canals, and it is no uncommon sight to see canal rising above canal in the higher elevations or hill sides. The Italians seem, better than any other European people, to understand the value of water thus applied to the land, securing several crops annually from the same land. In France Irrigation is common. The canals which ramify a large section of the country, are for the double purpose of internal navigation and Irrigation and play a great part in developing and enriching the better portion of France. In many parts of Austro-Hungary there are Irrigation works, many of them of private ownership, under which large tracts of land are either reclaimed or improved and in all cases made exceedingly fertile and profitable. In England, says a reliable authority, crops of grass upon irrigated fields of a total weight of more than eighty tons per acre, have been reported by trustworthy English farmers in one season. The alluvial lands along the upper Mersey have been fertile "water meadows" for centuries past. Great attention has been given to Irrigation in Australia in recent years. Commissioners from Australia have visited the United States and European countries examining the local Irrigation works, and have presented to their respective governments very elaborate reports. Large sums have been expended in constructing expensive works for utilizing the waters of the few great rivers of that vast continent. It is in the United States, however, that Irrigation has of late years received its greatest development and won its greatest victories, and in this connexion it may be stated that so important has the Irrigation interest become that there has been established in connexion with the Department of Agriculture at Washington, D.C., an "Office of Irrigation Inquiry," now in charge of Major Richard J. Hinton as Special Agent. In his report for 1892 the Special Agent thus summarizes some of the recent achievements of Irrigation in the United States:—

"In the past seven years the actual "area of reclamation by irrigation and "cultivation has increased from about "5,000,000 acres to at least 8,026,526 "acres. There are small areas scat- "tered throughout the region beyond "the 100th meridian west from Green- "wich, of which no reports have been "made, sufficient in total amount to "increase the figures to over 8,500,000 "acres. But greater activity than this "addition of 3,500,000 acres to the area "of cultivable land is seen in the "growth of important hydraulic "works. Under ditch this office "reports for 1891 an estimated area of "18,286,207 acres. The largest pro- "portion of this great addition to the "cultivable area will be made avail- "able for use within the next year, "and by the opening of the World's "Columbian exposition the United "States may anticipate the cultivation "by means of irrigation of at least "17,000,000 acres of land that within "the past decade has been declared by "learned authority wholly irreclaim- "able, worthless for agriculture, "useless for tree planting, and hardly "fit for even the grazing of scraggy "sheep and broad horned steer. Under "projected or partially constructed "works nearly 5,000,000 acres may be "added, making in all as now reclaim- "ed or in process of reclamation not "less than 25,000,000 acres." This official statement gives in few words a clear outline of the great work that Irrigation has accomplished in a few years in the United States as regards the area reclaimed or secured. Some interesting particulars will be learned from a perusal of the following table, which shows how this wonderful work

has progressed in individual states:—

	Under ditch. Acres.	Under cultivation. Acres
Arizona	660,000	315,000
California	4,500,000	3,550,000
Colorado	4,200,000	1,757,162
Idaho	1,200,000	330 000
Kansas—W of 97° longitude	900,000	120,000
Montana	1,250,000	410 000
Nebraska—W of 97° longitude	200,000	40,000
Nevada	150,000	100,000
New Mexico	700,000	465,000
North Dakota	2 500	2 000
Oregon—E of Cascades	125,000	45,000
South Dakota	100,000	54,000
Texas—W of 97° longitude	350,000	159,690
Utah	735,226	423,364
Washington—E of Cascades	175,000	75,000
Wyoming	3,038,481	180,000
Totals	16,367,794	8,026,526

This was the state of things at the end of 1891—over 8,000,000 acres actually under cultivation; over 16,000,000 actually under ditch, and, as Major Hinton explains, works projected or partially constructed which would bring the whole area under irrigation in 1893 up to 25,000,000 acres. There may be added to the above table the further fact that artesian wells are much utilized in some States for irrigation. California had over 3,500 such wells; Utah over 2,800; Colorado over 4,500; Texas over 1,000; South Dakota 950; the number in other States bringing the total up to over 13,695. Major Hinton's report contains a number of additional details of the progress made in the separate States. As these all go to show the deep interest taken in the question of Irrigation and the steady advance that is being made on all sides, a number of quotations are here given for the information of our Canadian readers. It will be noticed that the facts stated relate more particularly to the advance made in the year under review—1891. The report says:—

"In Nebraska, where in 1891 there was not a single irrigation enterprise in practical operation, there are now (1892) several scores of separate works under way in the western counties, by means of which a large area will be brought under cultivation, heretofore given over entirely to stock. In Western Kansas the beneficial influences, direct and indirect, have been as strongly felt as in the Dakotas. When the work began in 1890 the counties west of the 100th meridian of longitude were in danger of being entirely abandoned for agricultural purposes. . . Encouragement has also been given, by the large work done during the past twenty-one months, to agricultural enterprise and industry in South West Colorado, in Eastern New Mexico and throughout Texas west of the 97th meridian."

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"If the lines of cultivation and migration during 1891 were laid down upon a map they would show within the arid region of the United States movements so defined as to make a distinct parallelogram. In the region between the 97th meridian and the foothills of the Rockies, almost from north to south, there has been a decided growth of settlement and a marked increase of cultivation. The more distinctly this growth has been brought under the influence of irrigation development, however supplied, the more certainly it shows evidence of permanent prosperity."

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"The increased feeling of security in the Dakotas has been followed by as marked an increase in acreage and production. The Black Hills portion of South Dakota, for example, has almost escaped attention during the pendency of the present enquiry and discussion. In 1889 it was estimated that some 13,000 acres were cultivated chiefly for forage and cereals, by means of irrigation supplied by small ditches. In 1890 the area so cultivated was estimated at 20,000 acres. In his final report as geologist for the Dakotas in the artesian and underflow investigation, Prof. Garry E. Culver places the area of irrigated lands in the Black Hills section at 50,000 acres. In Nebraska and Wyoming, moving southward on the eastern line of the parallelogram, there will be found to be a considerable increase of population and a much larger proportionate increase of effort in the direction of extended reclamation works over the arid lands. The estimated increase for the year in Wyoming is 856,700 acres. That of Nebraska for works partially finished or in progress, shows an estimated increase of 135,000 acres under ditch and of 30,000 acres under cultivation."

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"Both North and South-Eastern Colorado have been benefitted by the movement under review. Many small enterprises are also recorded in the

eastern portion of that State. A special development of Eastern Colorado is the growing interest and effort in and for the establishment of reservoirs, both large and small. The valley of the Arkansas is marked by the progress of a number of great enterprises, one of which is distinguished by its efforts to utilize open depressions south of the river for storage purposes. One engineer reports seeing in the eastern portion of the State from an elevated point 134 storage basins, small lakes or ponds lying within the range of his vision. One of the chief objects of this effort is to obtain a supply for and store the same during the winter months so as to be able to keep the ditches running when planting begins in the spring. . . . In spite of the arguments relative to loss by evaporation and the waste claimed to follow all attempts to bring mountain supplies long distances without high altitude storage, the tendency is quite marked towards a development of storage basins upon the plains.

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"The North and South lines of the parallelogram of movement and development already indicated runs on the north chiefly through Wyoming and the southern portion of Idaho and further north up the valley of the Yellowstone and over the Rocky Mountains at Missoula into the Pacific North west, east of the Cascade Range. The increase of population has not been large but steady in character, while the increase in reclamation enterprises is on a decidedly large scale and the investments made and enterprises bown in construction point decidedly to an early effort to encourage and direct active settlement. Several great areas are opened up under this northern line. Perhaps the most direct increase of cultivation and the systematizing of necessary works upon the north is to be seen in the Gallitin Valley, Montana, where irrigation has practically been a success for the last 25 years. New and extensive areas that will soon invite occupation are to be found in Southern Idaho, Eastern Washington and Central Montana east and west of the Rockies. Extensive reclamation works are in progress in that state, but considerable attention must yet be given to organizing administration of the water and occupation of the land."

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"Another most notable development is in the matter of storage. Colorado is especially active in that direction The State Engineer's report for the 2 years from 1888 to 1890 shows the following totals:—

Reservoirs recorded in his office up to 1890	354
Ditches on file there 1888—No.	2,679
Estimated and stated mileage of same	10,023
No of Ditch appropriations recorded from 1888 to close of 1890	1,380
At an estimate of 4 miles to each ditch the total will be—miles	5,520

"The report for 1886 88 shows the total of 74 storage reservoirs, most of them smaller than the later constructions, while a number of them are only intended for stock purposes. The increase in 2 years has been 280, and if we are to allow a filing of one half more, or 140 for the year 1891, it would increase this class of construction, more of which are under way, to 494 storage sites. A great many of these —the majority in all probability—belong to the class of plains or open valley storage, already referred to. The increase in ditches and mileage for the past year would certainly be one half the total given for 2 years covered by the State Engineer's report —690 ditch filings with an estimated length of 2,710 miles. Adding these totals together we shall have for Colorado at the close of 1891 an estimate:—

Reservoir Sites and construction	494
Of ditches constructed and under way	3,669
Of mileage recorded and estimated	18,153
At 300 acres per mile this will give a total as under ditch—acres	4,445,090

[No. 3.]

In a paper on Irrigation published by the Agricultural Department of the Colorado Exhibit at the World's Columbian Exposition entitled "The Resources. Wealth and Industrial Development of Colorado," the advantages of the system as exemplified in that State are thus stated:—

"The superior advantages of Irrigation are manifest. The farmer can raise standard crops each successive year without failure. His land, unlike the soil of the older State in rain countries, requires comparatively little fertilization. Ordinarily land will hold its standard productiveness for 10 years; after that fertilization becomes more or less a necessity. The sediment deposited by irrigation is a constant fertilizer of itself, while the yearly rotation of crops keeps the land in a healthy productive condition. The farmer has the entire control of the making of his crops after germination, inasmuch as when he needs water he can apply it as the case require. No

crop is burnt up by continued drouth. His grains, grasses and vegetables are superior in quality in not having too much but just enough moisture in times when they most need it."

From the same work we learn that in Colorado by means of irrigation, and that alone, crops of all kinds are successfully grown in the foot hills and mountains at an elevation of 7,500 feet, or more than double the altitude of Calgary. San Luis Valley in Rio Grande County, is an irrigated district, and it has this elevation, and of this it is said: "It is in this valley that crops of oats have attained the highest growth and entire fields of wheat and oats have reached the biggest average and the greatest maximum in the State." The eastern portion of Rio Grande County was considered for a long time fit for nothing but stock raising. Although at an elevation of 7,500 feet irrigation has turned it into one of the best agricultural sections of the State.

In Boulder County, 5,000 to 14,000 feet elevation, fruit grows to perfection on all irrigated lands, and all the cereals and vegetables are successfully raised with heavy yield. Creameries are a success and bee culture an important industry. The same is true of Costilla, Delta and Eagle counties. Fremont County, which contains both mountains and plains, with the aid of irrigation "yields every vegetable, fruit or farm product that can be grown in the latitude of St. Louis or Washington." Fruit lands sell at $500 to $600 an acre. Grand County at a high elevation; Gunnison County 4,500 feet to 7,500 feet altitude; Jefferson County, largely foothills and mountain, make the same report. La Plata County has high mountains in the north, foothills and high mesas in the upper half, broad valleys and extensive mesas in the southern half. With irrigation the yield of all crops is enormous in all parts. Las Animas County has an elevation of 4,000 feet on the plains and 13,000 in the mountains. It has 85,000 acres under reservoirs on the prairie. It produces successfully all cereals, grasses and vegetables and some fruits. Dairying is a success. Logan County has a greater elevation than Calgary—3,920 feet; under irrigation wheat is the leading product. All the cereals, grasses and vegetables are successfully grown. Mesa County has an altitude of 4,000 feet. Fruits of all kinds as well as all agricultural products have their highest development here on the irrigated lands. Morgan County, elevation 3,000 feet, has a generous rainfall, but agriculture with irrigation is preferred. Pitkin County, the altitude of the valleys being 7,500 feet, produces under irrigation, alfalfa, (5 tons to the acre); clover, (3 tons to the acre); timothy, (3 tons); native grass (2 tons); potatoes, (6 tons); turnips, (12 tons); cabbage (12 tons), and so on. Most of the small fruits grow in great profusion. Prowers County (3,500 feet) has been by irrigation transformed from a cattle range into a rich agricultural region,—all within the last 3 years—"producing all the cereals, grasses and root crops, and the fruits of tree and vine." In Pueblo County (elevation 5200 feet, the lowest altitude of the valleys being 4,400 feet) "all these lands are productive wherever water can be applied."

In 1870 there were in the state of California only 7,086 lemon trees and 38,991 orange trees. The following table from the report of Mr. B. M. Le Long, secretary of the state board of agriculture (to use the words of Maj. Hinton) "will show the amount of increase since the general adoption of irrigation" up to 1892:—

	Orange Trees		Lemon Trees	
	Bearing	Not Bearing	Bearing	Not Bearing
Southern	982,357	2,636,000	83,572	264,343
Southern coast and Range	16,514	97,156	8 565	43,862
Coast Range	1,241	901	264	255
San Joaquin Valley.....	3,555	10,695	1,367	3,260
The Bay Counties	4,479	6,530	1,481	2,071
Sacramento	5,600	141 291	1,778	1,464
Foot Hills	11,049	139,643	1,459	3,726
Northern	74	125	44	....
	1,025,869	2,932,341	97,630	318,981

Total orange and lemon trees in California in 1892 4,374,721

Of the Perris district in California, where irrigation has been liberally introduced, it is stated on the highest authority, that the value of the land before the district adopted irrigation was only from $10 to $20 per acre. "The present selling value of the bare land is $50 to $75, subject to district assessments, while in a short time the unplanted land will bring $100." The following table, compiled by the state engineer for the purpose of making an estimate of the debt-paying ability of the district will show whether or not the district irrigation system will pay as a commercial investment on the part of those who buy the land and make farms, orchards, homes and towns thereon:—

	Value when Irrigation Commences	Value in 10 years	Value in 20 years
Farming lands	$2,000,000	$4,000,000	$6,000,000
Improvements	100,000	1,000,000	2,000,000
Town property and improvemeute	150,000	500,000	1,000,000
	$2,250,000	$5,500,000	$9,000,000

The total cost of the enterprise per acre of the entire district would be about $31.10, payable in instalments running over 20 years.

The results of irrigation at North Yakima and vicinity in Washington state are thus summarized from Major Hinton's report:—

Irrigable land before the construction of ditches was valued at $2 per acre. Its present value with water is estimated at $40; without water, $5. The crops are fruits, wheat, oats, potatoes, alfalfa, vegetables, hops and grasses. The yield is estimated at 50 per cent. more than on non-irrigated lands, however favorable the latter are situated for natural sub-irrigation.

In Kittikas county, Washington, the stock in West Side Irrigating Co. (one of the latest organized) is owned by about 40 farmers, and the water is supplied to about 10,000 acres. Before irrigation the land was worth $1.25 an acre; with water supplied it ranges from $25 to $150 an acre. . . . The general price of land under ditch would be about $60 an acre. . . . Wheat on irrigated land returns 60 bushels per acre, barley 50, oats 50, and other crops in the same proportion.

In the Yakima valley there are farmers who have offered the half of their holdings as a gift to secure complete irrigation for the remainder.

In Walla Walla county, where fruits are largely grown, the yield per acre under irrigation is from $180 an acre for tomatoes to $840 for blackberries and $600 for grapes.

In Montana, under irrigation in the Gallatin valley, the average crop yield per acre is potatoes 400 bus., oats 30 to 60 bus., wheat 40, barley 50 to 100, averaging 75. Without irrigation the yield is not over one-third of these. Irrigation begins the last of May or 1st June. The largest area under irrigation in some parts is laid down to grass and hay. Irrigated land is worth $35 to $50 per acre; land without water $5 to $7. In Yellowstone county without irrigation nothing can be grown; with irrigation the returns are—wheat 25 to 40 bus., oats 50 to 70, potatoes 300 to 400 bus. Bow county irrigated land is assessed at $100 and sells at $150; non-irrigated sells at $5. The effect of providing irrigation on the settlement of the country is shown by the following paragraph taken from a Montana paper during the present year:—

"The North Fork Canal and Reservoir Co., operating near Chinook, have completed their dam and canal sufficiently to irrigate 9,000 acres this spring. As soon as spring opens work will be resumed, and by fall they will have canal and reservoirs enough constructed to irrigate fully 50,000 acres. The water to supply the reservoirs and canal is taken from the Milk river. Within the last three weeks over 10,000 acres of land on the line of the canal have been filed upon by settlers."

The success of irrigation in Utah need not be dwelt upon. As every one knows, the Mormons have turned what was practically a desert when they entered the country into one of of the richest agricultural regions in the world. The original cost of land in Utah was $1.25; the present value of irrigated lands averages $84. A few details are in order Here is a brief statement from the pen of Mr. H. L.

A. Culmer, editor of the Salt Lake Journal of Commerce, which can not fail to impress every one:—

"As to crops raised by irrigation in Utah, I should put wheat and potatoes first, and alfalfa is among the very best. We have had yields of 4 tons of grapes to the acre, and 1,200 bushels of carrots per acre. . . . The people living here have demonstrated that irrigation means high cultivation; that we can make an acre of land yield more than an eastern farmer does. When we get water for our land we are not subject to the caprice of the climate. Forty acres here will support a family as well as 160 acres in Missouri and Illinois, and the Wastern family will be better supported. In this territory 8 and 10 acres in staple crops support families. It gives them enough to eat and enough to wear and a sufficient education. My brother told me for every day's work he put on a 40 acre farm he got $10 a day in return, year in and year out."

In New Mexico there has been in a few years an immense development of irrigation with most satisfactory results. Vast tracts of country which had been surrendered to cattle and sheep are being reclaimed and promise to be among the best farm and garden lands in the United States. Under irrigation in the Pecos Valley, not until then considered of any value for crops, the following practical results have been reached:—

"For instance, Thomas Stokes, of Look Out, Eddy Co., New Mexico, sold during 1891 (during the past nine months) over $300 worth of garden produce from ½ an acre of ground and has 400 lbs potatoes left. R. M. Gilbert whose address is Seven Rivers, Eddy Co., planted in the spring of 1891 one acre in potatoes and gave them no further attention whatever, except to irrigate them occasionally during the summer. When he dug them the yield was over 7,000 pounds They sold at 2 cents per lb.; so that the cash yield from this one acre was over $200(?) Mr. Gilbert stated that he can raise twice this quantity of potatoes to the acre with proper cultivation.

"W W. Paul, of Lower Penasco, New Mexico, raised 211 bushels oats on 2½ acres ground. Oats are selling here at 70 cents per bushel; cash yield $67 per acre. G. W. Blankenship, of Eddy sowed 12 acres rye on Sept 18, 1890; cut in May 1891; sowed millet on the same ground and cut two crops, the last on Sept 12, 1891, making 3 crops in 12 months. The total product in cash yielded $64 an acre. John W. Poe, of Roswell cut 600 tons of Alfalfa from 110 acres. This valued at $15 per ton, was $9,000 cash; cash yield per acre $80. Maynard Sharpe, of Eddy, sold $75 worth of water melons from one-eighth of an acre of ground. An acre at this rate would have yielded $600. He raised a second crop on the same ground but being pressed for help did not market any of it. L M. Holt, of Eddy Co., raised 11¼ tons of sorghum on one and a half acres and 450 tons of alfalfa on 90 acres. The Alfalfa will be sold at $15 per ton, making a return of $112 50 an acre." The sugar beet is being successfully raised.

"The security to stock raising which the development of water supplies under irrigation enterprise has produced is illustrated by the fact that over 500,000 lbs wool have been shipped from Eddy since June. 1891. It is estimated that over 1,000,000 lbs will be shipped in the following year (1892) George Blankenship and Edward Scroggins, of Eddy, have raised fine fields of cotton during the season of 1891. Many of the stalks bore from 60 to 90 bolls each. Such results can be obtained only under irrigation; they are impossible in any portion of the rain belt."

In connection with irrigation development in that section of the United states, the Irrigation Enquiry Special Agent says:—"The Special Agent after "his visit to Northern New Mexico "and elsewhere, expressed the opinion "that the success of the open table "land reservoir system, illustrated on "the Maxwell Grant, in Southeast "Colorado, at Nampa under the Boise "River in Idaho, and more recently "in the conservation of water in the "open lagunes which are being appro-"priated under the Bear Valley sys-"tem in Southern California, will add "from thirty to fifty million more "acres to the arable area of the coun-"try."

The results of irrigation in Oregon have been eminently satisfactory. In Klamath Co., the S. W. section of Oregon, the Upper Klamath Lake is

the source of supply for some 30,000 acres and can be utilized to supply 200,000 acres. "The crops grown on the lands irrigated are wheat, rye, oats and barley, alfalfa, potatoes and timothy grass. During the past season 2,000,000 bushels of grain were raised, being over 60 bushels per acre. The selling value of irrigated lands is from $15 to $20 per acre; non-irrigated the Government price is $1.25." In Harvey County, Oregon, under irrigation, the yield per acre is: hay 1½ tons, wheat 50 bush., oats and barley 75 bus. In Umatilla County; wheat 50 bus., corn 60, Alfalfa 10 tons, timothy 4 tons, beets or carrots 60 tons. In Wallowa County; wheat 30 bushels, oats 50, rye 2 tons, timothy 2½ tons, red top 3 tons.

The reports from those parts of Kansas where irrigation has been tried are equally satisfactory. Here is a report from Gray which says:—

"For grazing, 3 acres under irrigation are equal to 10 acres without. In orchards under irrigation the quantity and quality of fruit are equal to those of California." The yield of products in Gray County is as follows:—

	Without Irrigation	With Irrigation
Wheat and Rye.	8 to 18 tons.	.....40 to 50 tons
Oats ...	..... 20 to 25 "	.....80 to 120 "
Corn.....	... up to 20 "	.....65 to 100 "
Barley.....	...10 to 25 "	.....80 to 140 "
Irish potatoes a fail're 3 out of 4 yr		300 to 500 "
Alfalfa.....	....½ to ¾ ton in	....3 crops a year
rainy season; dry season none... 2 tons each.		

In Wyoming many millions of dollars have been expended in providing irrigation for the grazing tracts and for growing alfalfa and other fodder crops, thereby increasing the capacity of the land for pastoral purposes, lessening in all probability the area of ranches, and rapidly increasing the change already begun from cattle ranching to stock and breeding farms of a high character. "No failure of crops is known where the land is watered." Up to January 1, 1891, the estimated cost of ditches in Wyoming was $7,865,467, and the applications for ditch appropriations for 1891 would necessitate the expenditure of another $3,464,269, — and this in what has generally been considered an exclusively grazing State.

Coming to our Canadian Northwest and to the district for which we claim the assistance of the government, it is found that wherever irrigation has been attempted it has been successful. To give the particulars that are available in this connexion would extend this paper unduly in length; we therefore reserve the data for Southern Alberta and Western Assiniboia for the concluding paper of the series.

Testimony could be multiplied without end to demonstrate, by the actual experience of sixteen States of the American Union and tens of thousands of cultivators of the soil in those states, as well as by what is going on under our own eyes in Southern Alberta, that the unqualified success which has attended the practice of irrigation in the older countries of the world has been repeated in North America, in climates similar to those of the Northwest Territories—and in these Territories themselves wherever irrigation has been attempted. We are perhaps more especially interested in the ten to twenty years' experience of the States lying along our frontier, and we find that as great results have been achieved in Oregon, Washington, Montana, North Dakota, etc., in proportion to the lands under cultivation, as in the more southern and warmer States. When objection is made to the proximity of parts of our Territories to the mountains, as unfavorable to the growth of cereals, fruits, etc., the objectors can be pointed to the state of things in Colorado especially, where such crops are found to flourish, under the irrigation system, on elevations of from 5,000 to 8,000 feet,—a much higher altitude than that at which we are ever likely to attempt the cultivation of grain or fruit in any part of the Territories. The fact is established that with the assistance of irrigation farming and gardening can be successfully carried on over any portion of our Canadian Northwest and that we need not regard one single foot of soil in all this vast area, within the reach of water, as non-cultivable. As for the vastly increased returns from the soil under irrigation the facts speak for themselves; and here, as in Italy, it is found that even in localities where there is a liberal rainfall, the irrigation system is more convenient, more reliable and more profitable; and is accordingly preferred.

As regards the cost of bringing water to the land and of maintaining the works from year to year, in Southern Alberta and Western Assiniboia, this is a question that actual experience alone can decide. So much depends upon the contiguity or otherwise of lands to rivers and streams, the general character and cost of the works, and other conditions which will suggest themselves. Even as regards works actually constructed in the United States (whether by private corporations, by bodies of farmers forming mutual associations, or by what are known as Water Districts where the people of a county or of several counties unite to tax themselves to build the works), the data are deficient for forming a correct judgment. Still, we find it stated, on good authority, that in Arizona the first cost of water has amounted to $7.07 per acre; in New Mexico, $5.85; in Utah (under an imperfect system) over $15. The annual water rental in different localities may be stated as follows:—

Utah	average per acre.....	$0 91
New Mexico	" "	1 54
Arizona	" "	1 55
Colorado - by counties—		
Rio Grande Co,	ave per acre....	1 10
Boulder Co,	" " ...	1 25
Kiowa Co	" " ...	1 50
Montez ma Co,	" " .	1 50
Prowers Co	" " ...	1 10
Sagauche Co,	" " ...	1 40
Weld Co,	" " ...	1 50

The perpetual water right in Kiowa Co., Col., is placed at $800 for 80 acres, with an annual maintenance assessment of 15 cents per acre; in Prowers Co., Col., perpetual right for 80 acres, $1,000—annual assessment, 15 cents; Sagauche Co., Col., perpetual right for 80 acres, $400—annual assessment, 25 cents; Weld Co., perpetual right, $1,200 for 80 acres—annual assessment, 12½ cents.

In all probability these figures are as high as any in the United States, as the topographical difficulties in a rough country like Colorado are probably as great as have to be overcome in any portion of the continent.

With this class of work undertaken, as proposed herein, by the Dominion Government in Southern Alberta and Western Assiniboia, the work of construction and maintenance would be greatly simplified and reduced to a minimum of cost. The government could build the necessary works and make an annual charge per acre, according to the cost and the service needed, and there would be on the farms no "first cost" charge, and no "annual assessment" as it is called in the United States.

It has been demonstrated beyond all possibility of cavil that irrigation has worked wonders in the arid lands immediately to the south of our Northwest Territories. It has also been shown by actual experience that in these Territories themselves the same results follow the application of water to arid soils. Wherever irrigation has been attempted in Southern Alberta it has been absolutely successful. To illustrate:—

Many gardens in Calgary have been irrigated by means of the Calgary Waterworks, and although the soil of the Calgary bottom has not been regarded as very favorable either for farm or garden products, the yield of roots and vegetables with the assistance of the water has been most abundant—great in size and excellent in quality.

At the mouth of Fish Creek, on what is known as the old Government Farm, the owners, Messrs. Hull Bros, last spring laid a ditch from Fish Creek on to a large area of land seeded to oats, with the most satisfactory results. The benefit to hay lands was equally great. The extra crop secured in the first year will repay the full cost of the works, which was over $2,000. So satisfactory has the application of water proved that Messrs. Hull intend to go into irrigation on a much larger scale on their farm, which embraces several thousand acres and is one of the most valuable estates in the Northwest.

On Sheep Creek Mr. John Quirk has carried the waters of the creek to his hay lands, and this year the difference

between his irrigated and his non-irrigated land is the difference between an abundant grass and hay crop and no crop at all.

On High River some three or four small ranchers joined to build an irrigation ditch, with equally gratifying results.

Captain Gardiner, rancher, on the Elbow river near Calgary, has put in two ditches this present year—one a mile in length, the other three-fourths of a mile. Twenty acres of oats and timothy were watered this season with most satisfactory returns, the timothy measuring 3ft. 6in. at time of cutting. Two hundred acres will be irrigated in all.

Here and there through Southern Alberta we hear of similar operations with equally good returns in every instance.

This season a large number of farmers and ranchers have had irrigation ditches surveyed for them by Messrs. Child & Wilson, engineers, of Calgary. In addition to those for Captain Gardiner we may mention the following: –

Mr. Walter Skrine, rancher, Mosquito Creek—a ¾ mile ditch for irrigating oat field and meadow; to cover 100 acres.

Mr. George Lane, Victor ranch, Willow Creek—3 mile ditch for watering hay meadows.

Messrs. Lucas and Eastman, on the Elbow river—a ditch to water the bottom lands.

Mr. Scott, on Elbow river—a 1 mile ditch to irrigate 150 acres.

Mr. R. C. E. Hooper, on Elbow river—a 1 mile ditch to irrigate 100 acres.

Mr. George Patterson, on a tributary of Sheep Creek—a 1½ mile ditch to irrigate 80 acres and for domestic uses.

We hear also that Mr. W. W. Stewart, rancher, of Jumping Pond, is putting in a ditch for hay lands; and the Messrs. Alexander will also irrigate a portion of their meadows on their ranch on Mosquito Creek.

More extensive works of this character have been commenced. These include a long ditch on the Blackfoot reserve on the Bow river, near Gleichen railway station. While we write a government engineer is making the necessary preliminary surveys. The work will be done mainly by the Indians themselves under the supervision of the Indian agent, Mr. Magnus Begg. The object is irrigation of native grasses and for farming and gardening.

Two of the joint stock companies with headquarters at Calgary, that were granted charters at the last session of Parliament, have commenced construction operations in comparatively well settled districts.

The Calgary Irrigation Co. is taking water from the Elbow river at a point 30 miles, by river, above its mouth, namely, in Sec. 4, Tp. 24, R. 4, west of the 5th principal meridian. Its laterals will supply water to about 4,000 acres south of the Elbow river in Tp. 24, R 's 2, 3 and 4. The main ditch will cross the Sarcee reserve, where reservoir sites will be constructed. Thence a branch can be taken cheaply across Fish creek to the land lying between Fish and Pine creeks, where some 40,000 acres can be cheaply irrigated; and by crossing Pine creek the area can be increased if necessary to 100,000 acres. Another branch will bring waters to Tps. 23 and 24, lying between Fish creek and the Elbow river. At least 85% of the land in these townships can have water supplied at a comparatively small outlay in fluming; and water can be had from the same works to cover the flats lying between the Bow and Elbow rivers east of Sec. 18, Tp. 24, R. 1, west of the 5th P.M., namely, the town of Calgary and the Mission property. To carry out the scheme here outlined in its entirety probably $300,000 would be needed. The work will be proceeded with by sections as the funds on hand may warrant. It is thought the cost per acre will be about $7—the promoters believe it will certainly not exceed $10—for water

furnished by main ditches. The surveys were commenced in November, 1892; construction was commenced on Sept. 20, 1893, and will be proceeded with as money may be forthcoming. A relaxation of the financial stringency is anticipated before spring, and it is thought there will be sufficient capital available for the company to place water on Tps. 23 and 24, R. 1, for which there will be any demand—probably on 50% of that area, in 1894. The provisional directors of the company are Messrs P. T. Bone, C E., J. P. J. Jephson and William Pearce. $25,000 has been subscribed, and already 20% of that amount has been paid in.

Another of the charters granted last session was to the Calgary Hydraulic Co., Ld. Construction work has been commenced by this company. Water is taken from the south side of the Bow river, above Twin bridges, about 10 miles west of Calgary. The Bow river will be crossed to the north side by a flume 1,500 feet long, above Mr. Oswald Critchley's residence. The ditch as at presented projected will run about 9 miles, watering the Bow bottom to a point near the town of Calgary. The work was commenced on Sept. 11th, and it is expected that the first half, including the crossing of the river, will be finished this fall, and to have the remainder in such shape as to secure its completion early next spring. Mr. George Alexander, of Calgary, is president of the company, and Mr. H. B. Alexander secretary-treasurer.

These are all evidences of the faith the people of the country in the benefits to be derived from irrigation.

At all points in the Southern Alberta district, where farmers of means with properties alongside of rivers have adopted irrigation, the results have shown that the soil is capable of abundant returns, the only want being the absence of water. With either a liberal rainfall or natural irrigation, wheat, oats, barley, the native grasses, roots and vegetables of every description reach perfection and compare favorably with those of any country in the world both as regards quality and quantity per acre. It should be stated that this is true of the MOST ARID portions of Southern Alberta, without any exception whatever, whenever there has been a "wet" season with an abundant rainfall—as may happen once in three or four years. And that there may be no misunderstanding of the possibilities of successful farming in this region it may be stated that the wheat which stood the very highest at the Millers' Exhibition in Liverpool in 1892 was forwarded from Calgary and was grown on Sheep creek, 20 miles south of Calgary. The country around Macleod, which is as dry as any in the Northwest, has in "wet" seasons produced as fine samples of wheat as the eye of the expert could desire to look upon.

The small works that have been constructed and the larger works under way or in contemplation are confined to a section of country that is thickly settled. These, of course, can accomplish nothing for the unsettled portions of that great extent of country to which we shall now refer.

The portion of the Northwest Territories more immediately calling for irrigation is briefly described by Mr. William Pearce (Supt. of Mines and member of the Dominion Lands Board) as "that portion west of the "eastern limit of the Missouri Coteau "and south of Township Thirty." The body of arid lands known as the Missouri Coteau projects into the Canadian Territories from the south, the eastern limit extending from the International boundary between the 103rd and 104th degrees of west longitude and running in a north-west direction, up to the Canadian Pacific railway. Township 30, indicated

by Mr. Pearce as the northern limit of the arid area of the Territories, would carry it to the latitude and possibly to about the vicinity of Bonnington Station on the Regina and Prince Albert Railway in Western Assiniboia, and of Carstairs station on the Calgary and Edmonton railway in Alberta.

A glance at the map shows the greater part of this region to be admirably supplied with rivers and creeks,—the Red Deer and its numerous branches, the Bow, the Belly, the Old Man's, St. Mary's, Milk River, White Mud, Old Wives; besides many lakes. The Old Man's and St. Mary's with sundry other considerable rivers in the extreme S. W. corner of Alberta unite near Lethbridge to form the Belly, flowing east; the Belly and the Bow then unite further east to form the South Saskatchewan; which then flows north and in or near Township 23, a few miles east of the 4th principal meridian, is joined by the Red Deer from the west and flows east and north until it unites with the North Saskatchewan near Prince Albert. It only needs an examination of the map to convince any doubter of the extraordinary facilities thus afforded even in the arid region for irrigating millions of acres of valuable land cheaply and thoroughly by means of these great rivers with their innumerable large and small tributaries, creeks, springs, etc.

Taking Southern Alberta, for instance, as a special district for examination, it is seen that south of Township 30 and not including the Bow river's tributaries in the mountain region, there are the Rosebud and its branches, which fall into the Red Deer River; the Kananaskis joining the Bow above Morley; Nose Creek and the Elbow uniting with the Bow at Calgary; Fish Creek, Pine Creek, Sheep Creek, High River and its several forks, all falling into the Bow within 30 miles of Calgary; the Little Bow, Mosquito Creek and Willow Creek flowing to the Belly; besides Pincher Creek, Lee's Creek and other streams in the S. W. corner. Here are the means of irrigating hundreds of thousands of acres; to say nothing of the immense areas adjacent to the Bow east and south of Calgary, the Old Man's near Macleod, the Belly and Saskatchewan between Lethbridge and Medicine Hat, and the great tracts of territory irrigable from the St. Mary's and Milk rivers near the International boundary. Both north and west of Medicine Hat the possibilities of irrigation from the Saskatchewan are very great, while along the Dunmore and Lethbridge railway the country between the railway and the Saskatchewan, at present with little or no population, would with irrigation offer special advantages for settlement.

As regards the Bow Valley, the area open to irrigation is practically unlimited, both because of the great body of water in the river for irrigation purposes and the high elevation at which water can be taken for the use of the entire valley, which allows of perfect irrigation for all the benches Cochrane, on the Bow River, is 23 miles west of Calgary, 33 miles west of Shephard, 53 miles west of Langdon, 78 miles west of Gleichen; and is 800 ft. higher than Gleichen. As every traveller by railway over this tract of country knows, there is a gradually ascending grade going west. It is scarcely necessary to detail the advantages thereby offered for spreading water over the entire country—bottoms and benches—of all this vast body of excellent land. In fact, it would be difficult to find anywhere an extensive tract of country so easily irrigated or which would give such large returns for the necessary expenditure.

The primal source of water supply for all this great area in Southern Alberta is, of course, the Rocky Mountains. The rivers and streams issuing from that great storehouse will flow on for ever. As long as snow falls and the sun

shines water in the greatest abundance for the irrigation of the valleys and plains of Southern Alberta is ensured. On the upper Bow and in all the foothills are natural basins for holding and retaining the mountain waters near their source, should this be found necessary. The ridges between rivers offer a natural pathway for the construction of ditches irrigating the sloping lands on either side. Natural depressions, coulees and lakes will provide storage basins on the plains. Thus, for the great reservoirs in the mountain districts and for any and all reserves that may be needed elsewhere, the immense area of mountain drainage will always provide an inexhaustible supply, while the numerous rivers, streams and creeks, aided by irrigation canals, main ditches, laterals, etc., will provide the means of distribution over the whole face of the country to an extent probably unsurpassed by any system of distribution that is known to exist. This is true in the main, though differing somewhat in detail, not of Southern Alberta alone but of south-western Assiniboia, where (next to the South Saskatchewan) the source of supply is the Cypress Hills, and where numerous rivers and creeks extending into the country south of the hills offer superior channels of local supply and distribution. This in addition to the immense body of water in the South Saskatchewan whose volume will not be sensibly diminished by the diversions made for irrigation to the westward.

And here a most important fact must not be omitted, namely, that the mountain streams are at their highest when their waters for irrigation will be most needed,—that is, in midsummer; thus reducing the expense (if any) to be incurred for storage basins to a minimum.

Beside all the rivers of both Territories lie immense areas of land with soil capable of producing anything and everything that can be grown in the temperate zone,—in a climate second in point of health to none on earth,—in a country capable of sustaining millions of people, and countless herds of horses, cattle and sheep. Nowhere in North America can irrigation systems be so cheaply provided; nowhere would the application of water work greater changes for the public good and the enrichment of the Dominion.

While the means of private individuals favorably situated for irrigating their own lands, and the capital of joint stock companies who operate in well settled districts, will go a moderate distance towards meeting the wants of certain localities, it is not reasonable to hope for private capital to an extent adequate to the wants of the country undertaking the development of irrigation systems which would mainly benefit lands still in the possession of the Government and unoccupied by a single settler. The greater part—nearly the whole—of the country we have described is held by the Government as owner, though a portion is under terminable leases to cattle companies, and a certain area has been granted to the Calgary and Edmonton Railway Company. Practically nine-tenths of the arid region as located by Mr. Pearce is government land which the government cannot dispose of on any terms. The question for the government to determine is whether these lands shall remain as they are, unoccupied, producing nothing except, in some portions, a paltry rental for cattle pasture; or will the government by a moderate expenditure of money render these lands the most saleable and the most productive in the Dominion? Will the government be justified in leaving lands in a comparatively worthless condition which can be made the most valuable of all the Dominion's assets? What excuse can they offer to the country and to Parliament for neglecting to bring into beneficial use an immense area of excellent soil when the water to enrich this soil and give value to every acre of these lands lies alongside

and only requires to be diverted to the land?

As to the government's duty in the premises we will let a good authority—an experienced government official who knows the country thoroughly and who will not be accused of suggesting reckless experiments with government funds—speak in this connexion. Mr. William Pearce (Supt. of Mines and member of the Dominion Lands Board), in the paper prepared by him for the annual meeting of the Association of Dominion Land Surveyors in 1889 in support of a comprehensive irrigation scheme for Southeru Alberta and Western Assiniboia, says:—

"It is worthy of serious considera-
"ion whether any large scheme of
"settlement and irrigation should
"not be conducted by the Goverment
"rather than through private enter-
"prise. The enhanced value of the
"lands would amply recoup the
"Government for the outlay. What
"an enormous benefit would result to
"the country if settlement and pro-
"ducts could be increased, even to
"one half the extent which I suggest as
"probable; and certainly Government
"control is preferable for the general
"advantage. Private investors would
"be most anxious to secure large pro-
"fits and quick returns and would pro-
"bably be somewhat dilatory in tak-
"ing action whilst endeavoring to de-
"monstrate to investors and possible
"shareholders the advantages which
"the speculation offered. The Gov-
"ernment, on the other hand, once
"convinced of the soundness of the
"scheme, the advantage to result in-
"directly from the improved settle-
"ment and producing power of the
"district, might feel justified in pro-
"ceeding immediately and in a t-
"ing a slow return of the actual money
"invested. I dare say a calculation
"might readily be made to show that
"a handsome percentage on the capi-
"tal invested would very speedily re-
"sult from increased customs and ex-
"cise returns."

We have no doubt that every man and woman in these Territories who has given the slightest consideration to the subject will heartily endorse Mr. Pearce's very reasonable statement. We offer no apology for adding here the estimate which Mr. Pearce made of the increased value which irrigation under Government auspices would give to the lands in the arid region referred to. Says Mr. Pearce:—

"The area of this district is 66,960
"square miles and would according to
"the above computation allowing four
"sections for every settler, accommo-
"date 16,740 families; and estimating
"that each is worth to the country
"$1,000 owing to the customs and ex-
"cise duties which he pays, the whole
"value would be $16,740,000. The
"value of the annual product of each
"settler may be estimated at $500,
"giving a total value of $8,370,000, and
"supposing that each settler has 100
"head of cattle, 1,674,000 cattle will
"graze in this district.

"Suppose, however, that the produc-
"tive power of the district could be
"quadrupled (and I hope to assure you
"that this may be regarded as a mod-
"erate estimate of the results to be
"achieved by adopting a proper sys-
"tem) the number of resident families
"would be 66,960; the annual products
"$33,480,000; the value of these settlers
"to the country $66,960,000; the num-
"ber of cattle 6,696,000, the value
"of which at $20 per head would be
"$133,920,000. The value of the annual
"products would probably exceed
"largely $500 per head, as under the
"system which I have in view their
"products would be more valuable
"than at present. We would most
"certainly arrive at the highest state
"of perfection in all products, cattle,
"horses, hogs, poultry, dairy products,
"hides and leather, nature having
"richly endowed this district with the
"natural conditions requisite to that
"end.

Judged by the results accomplished in the States to the south, Mr. Pearce's estimates would seem to be well within the mark. Actual experience goes far beyond Mr. Pearce's expectations.

That the administration of irrigation systems by governments may be made highly profitable to the public treasury has been established by the experience of the Government of India. In a work by Mr. Henry Stewart, a United States civil and mining engineer, entitled "Irrigation for the Farm, Garden and Orchard," we read as follows on page 174, latest edition:—

"In favor of Government control there is both reason and precedent. By no other authority could the conflicting interests of miners, agriculturists, and owners of land to be injured or benefitted by the enterprise, be properly reconciled. In Europe, the supreme control is exercised by, and the ownership of the water vested in the State. The French Government in 1669, by special law reserved the ownership of all rivers and streams, and grants concessions to irrigation companies under restrictions. In Italy, the state has always exercised this ownership, and in Venice the springs, and even the rainfall so far as it can be stored in reservoirs, have been held to be public property. In India the springs and rainfall are accumulated in reservoirs, controlled by the Government, and the river systems are also owned by it; not only this, but the details of the distribution of the water are also directed by government officials. This is made necessary, however, by the incapacity of the ignorant inhabitants to manage anything for themselves, that calls for more than a very low degree of intelligence. Lest, however, it might be urged that Government ownership and supervision are likely to lead to failure, the actual results attained in India may be very properly here cited. During recent years, the British Government has spent about $70,000,000 in irrigation works, and others are in progress of construction which will require half as much more to complete them. In almost every instance the investments have been profitable, and in some cases enormously so, both in the way of water rent, and in service to the cultivators of the soil. The total annual revenue to the government from the works, is more than $5,000,000, or 7¾ per cent on the cost. In one case only has there been a loss. The capital expended in the largest works, and the annual revenue from them, are given in the following table, which is derived from the official reports of the East Indian Government:—

	Capital Invested	Annual Revenue
North Western Provinces	$17,887,225	5½ p. c
Punjaub	15,671,060	5 "
Madras	9,467,200	22¾ "
Bombay & Sind	11,113,940	12 "
Ganges Canal	14,400 390	4½ "
Eastern Jumna Canal	2,350,000	11½ "
Western Jumna Canal	6,532,000	7½ "
Godavery Delta Work	3,418,525	39¾ "
Kistnah Delta Works	2,337,135	13½ "
Canvery Delta Works	1,468,000	36½ "
Sind Inundation Canal	5,930,000	18½ "

The revenue to the government is the least portion of the profit derived from these works. The profit to the people themselves amounts to a vastly greater sum, one in fact the amount of which is not to be computed in money; for the famine, of frequent occurrence before the completion of these works, destroyed thousands of human lives, and caused thousands of square miles of fertile land to be abandoned to grow up to jungle. In 1868, the Ganges Canal preserved grain crops from destruction which fed a million of people; in 1874 the Soave Canal saved the crops over a large territory, which would otherwise have been devastated by drouth and many of the newer works water regions which have heretofore been visited with some of the most destructive famines mentioned in history; and the whole of this work has been undertaken and successfully managed by the Government."

We urge the Government of Canada to undertake this work of irrigation in Southern Alberta and Western Assiniboia for a variety of reasons, any one of which should be conclusive, and regarded as a whole they are irresistible:—

1. The Government has a vast property in land lying valueless which can be rendered enormously valuable at a moderate expenditure of public money No private owner with the means in hand would hesitate a moment to make the expenditure.

2. The fact of this valuable land lying unoccupied has a bad influence on immigration and settlement and is

an injury to the country as a whole. A change cannot come too soon.

3. The lands if irrigated would be at once in demand by Canadians and by immigrants from the United States at the highest selling price of any in the Government's possessions. Millions of dollars above the cost of irrigation can be realized for them, once the water is applied.

4. Government irrigated lands would be the best advertisement possible to put before the farmers in Washington, Idaho, Oregon, Montana, Nebraska, etc., where irrigation is a common thing and preferred to non-irrigation. The government, through its ability to borrow money at 3 to 3½ per cent., can construct irrigation works more cheaply than the joint stock company or the individual who pay twice that price for the use of money. Therefore the government's charge for the use of water need not be half of what private parties would be obliged to collect from the consumers. Settlers from the States would consequently give a preference to irrigated lands in the Canadian Territories over those in their own country; which, joined to the absence of local taxation here as against enormous rates of local taxation in the States, would turn the faces of tens of thousands of new settlers from the States in our direction.

5. Because there is no form in which government money can be invested for public purposes (not railways, canals, fishery bounties, fish hatcheries, bonuses to ship railways or steamship lines, pensions to government officials, etc.,) that will bring so great and so beneficial a return to the country as a whole.

6. Because the requirements of the sections of the Territories referred to absolutely call for this measure of justice at the hands of the Government, and because in no other way and through no other agency can the dormant wealth of those districts be as satisfactorily or speedily developed and utilized to the building up of our common country.

For these reasons we ask the Parliament and government of Canada not to turn a deaf ear to the wishes and interests of the people of Alberta and Western Assiniboia. There is within the reach of Parliament an opportunity of doing an incalculable amount of good, not for those districts alone but for the whole of Canada. There is involved in our proposition nothing less than a demonstration of what we, residing in this country, believe to be a fact: that there is not in the whole of the Northwest Territories a bit of country that can not be made productive. There are no "barren lands" in these Northwest Territories in the true meaning of that term. There are no worthless "alkali" lands. If there are lands to which nature has denied a generous rainfall, she has nevertheless provided in another way the water necessary to the germination of whatever may be committed to the soil for the sustenance of man and beast. She has given the means of defying climatic changes and drawbacks. She has placed within easy reach those water supplies which alone are needed to change the arid plains into fruitful farms and gardens. It is not to be credited, therefore, that where nature has done so much the Parliament and Government of the country will do nothing to supplement nature's gifts. We anticipate, for the wise solution of the problem, the serious consideration both of Parliament and Government and such liberal action as past experience shows has not been denied to any proposition based on benefits to accrue not to a section only but to the whole of our common country.